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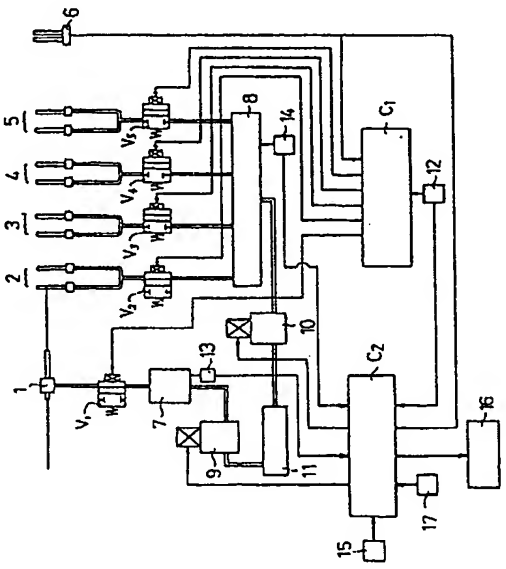
(54) Apparatus for controlling weft inserting air pressure in a jet loom.

(57) The apparatus provides for automatically changing the data of various control factors necessary for air injection pressure controlling, which control factors including the sampling number of times at which the leading end of respective insert wefts arrive at the weft detector (6), incremental step for air injection pressure adjustment, allowable minimum and maximum limits of air pressure and other parameters from the trial weaving operation to the actual production weaving operation.

With various data of control factors, such as sampling number of arrival times of the leading ends of a plurality of inserted wefts detected by the weft sensor (6) from which an average arrival time is determined, incremental step for air injection pressure adjustment, allowable minimum and maximum limits of air pressure and further parameters stored in the computer control C_2, the control factor data for the trial weaving are changed to the control factor data for the production weaving when the loom operation is changed from the trial operation to the production operation, and the values of the air injection pressures detected by the pressure detectors (13, 14) just when the above loom operation change is made, are established as the reference air pressures for the actual production weaving operation.

Fig. 1



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The present invention relates to an apparatus for controlling weft inserting air pressure in a jet loom of the type wherein a weft is inserted by air jets injected from weft inserting nozzles the pressures of which are controlled in accordance with the information representative of the time at which the leading end of an inserted weft arrives at a weft sensor adapted to detect such leading end of the inserted weft.

In a jet loom wherein a weft is inserted by air jets injected from weft inserting nozzles, the condition of weft insertion is largely dependent on the pressure setting for the air jets. Even if an optimum pressure is established for a given weft during trial weaving operation, flying condition of the weft may be varied during the subsequent actual production weaving operation due to various influencing factors such as varying weft supply cheese diameter, irregularities of the weft itself, etc., with the result that successful weft insertion may not achieved under the initially established air pressure. The use of an electrically-operated air pressure control valve is proposed by Publication of Examined Japanese Patent Application No. 64-3969 (1989), which control valve is provided in the passage for air under pressure to a weft inserting nozzle for controlling the air injection pressure of the nozzle according to the information representative of the time at which the leading end of an inserted weft reaches, or arrives at, a position defined by a weft sensor for detecting the leading end of such inserted weft.

Various control factors are used in actuating the above electrically-operated pressure control valve, including averaged arrival time of the leading ends of a plurality of inserted wefts, reference air injection pressure and incremental step for air injection pressure adjustment, i.e. the minimum degree by which the pressure is increased or decreased for adjustment. To be more specific, an average arrival time is figured out from a predetermined sampling number of detected arrival times, and the air injection pressure is controlled with respect to the reference pressure within a predetermined range according to the above average arrival time. It is to be noted that the data of the control factors used for the trial weaving operation are established differently from those employed in the actual production weaving operation. For example, value of data for the incremental step air injection pressure adjustment is set relatively large in the trial weaving operation so as to permit the air injection pressure to reach its optimum value as quickly as possible, whereas it is set smaller in the production weaving operation than in the trial weaving because the weft insertion during production weaving has already become relatively stabilized. For the same reasons above, the range of maximum and minimum limits of air injection pressure with respect to the reference pressure is set narrower in the production weaving operation than in the trial weaving operation. In view of the fact that the range of air injection pressure tends to influence the ease of controlling of weft inserting condition, this range should desirably be set moderately narrow for improvement in controlling of weft insertion.

Since the data for the various control factors for the production weaving operation are thus different from those for the trial weaving operation, it is unavoidable for machine operator to perform a troublesome and time-consuming procedure of setting individual data when shifting the loom operation from its trial running to the actual production weaving operation.

Therefore, an object of the present invention is to provide an apparatus which is capable of automatically setting the data of control factors for the production weaving operation from the data for the trial weaving operation.

According to the invention, there is provided an apparatus comprising weft detecting means for determining the time at which the leading end of each inserted weft arrives at said weft detecting means, pressure detecting means for detecting air injection pressure of weft inserting nozzle, injection pressure setting means for storing data of injection pressure control factors for trial weaving operation and similar data for production weaving operation and also storing data of detected injection pressure, said control factors including the sampling number of the arrival times, the incremental step for injection pressure adjustment, the range of permissible maximum and minimum limits of the injection pressure, etc., injection pressure adjusting means responding to commands from said injection pressure setting means for adjusting the injection pressure of the weft inserting nozzle, and selecting means for selecting the control factor data for the trial weaving operation or the control factor data for production weaving operation, and the injection pressure setting means is provided with a function of setting the injection pressure detected by said pressure detecting means just when the selection of the data for the production weaving operation is made, as the reference injection pressure for that production weaving operation.

According to another embodiment of the invention, the injection pressure setting means is provided with a function of selecting the data of control factors for the production weaving operation when the arrival times of a predetermined sampling number fall within a predetermined permissible range and the variation of detected injection pressures falls within a predetermined range, and also a function of setting the injection pressure detected by the pressure detecting means just when the data of control factors for the production weaving operation are selected by the injection pressure setting means, as reference injection pressure for that production weaving operation.

In an embodiment of the invention, while the control factor data for the trial weaving operation are

selected by the selecting means, the injection pressure setting means provides command to the injection pressure adjusting means to perform the injection pressure adjusting control according to that control factor data for the trial weaving operation. When the control factor data for the production weaving operation are selected by the selecting means, the injection pressure setting means provides command to the injection pressure adjusting means to perform the injection pressure adjusting control according that control factor data for the production weaving operation. When the loom operation is thus changed from the trial to production weaving, the injection pressure setting means establishes the injection pressure detected just when the selection is changed, as the reference pressure with respect to which injection pressure controlling is performed during the production weaving operation.

In the second embodiment of the invention, the injection pressure setting automatically selects the control factor data for the production weaving operation when the arrival times of the predetermined number of sampling fall within the predetermined permissible range and also the variation of the detected pressure becomes stabilized as required.

The Apparatus allows for automatically changing the data of various control factors necessary for air injection pressure controlling, which control factors including the sampling number of times at which the leading end of respective insert wefts arrive at the weft detector, incremental step for air injection pressure adjustment, allowable minimum and maximum limits of air pressure, etc., from the trial weaving operation to the actual production weaving operation. With various data of control factors, such as sampling number of arrival times of the leading ends of a plurality of inserted wefts detected by the weft sensor 6 from which an average arrival time is determined, incremental step for air injection pressure adjustment, allowable minimum and maximum limits of air pressure, etc., stored in the computer control C_2, the control factor data for the trial weaving are changed to the control factor data for the production weaving when the loom operation is changed from the trial operation to the production operation, and the values of the air injection pressures detected by the pressure detectors (13, 14) just when the above loom operation change is made, are established as the reference air pressures for the actual production weaving operation.

Examples of the invention and details thereof are be described in detail below wiht reference to the drawings which illustrate only specificembodiments in which:

FIG.1 is a schematic diagram showing combination of the weft inserting apparatus and the air pressure control circuit;

FIG. 2 shows a screen on the display device in the adjusting mode;

FIG. 3 shows a screen on the display device in the detecting mode;

FIG. 4 shows a screen on the display device in the production mode;

FIG. 5 shows part of the program for changing the operational mode according to a first embodiment of the invention;

FIG. 6 shows remaining part of the program for changing the operational mode according to the the first embodiment of the invention;

FIG. 7 shows part of the program for changing the operational mode according to a second embodiment of the invention; and

FIG. 8 shows the remaining part of the program for changing the operational mode according to the second embodiment of the invention.

The following will describe an first embodiment of the invention while referring to FIGS. 1 through 5.

A weft Y ejected from a main weft inserting nozzle 1 of a weaving loom is assisted in passing through a shed by relayed air jets from a plurality of auxiliary nozzles, or sub-nozzles 2, 3, 4, 5. If weft insertion is done properly, the leading end of the weft can be detected by a weft sensor 6 within a predetermined range of rotational angle of the weaving loom. Signals from the weft sensor 6, which represents the presence or absence of such detected weft, are transmitted to a computer control C_2 which in turn commands the loom to continue or to interrupt its operation according to the signal that the control receives.

Injection of air from the main weft inserting nozzle 1 is controlled by a solenoid-operated valve V_1, while and injection of air from the auxiliary weft inserting nozzles 2-5 is controlled by similar solenoid-operated valves V_2, V_3, V_4, V_5. That is, air is injected from the respective nozzle when the solenoid of its associated valve is energized thereby to open the valve, and the air injection is stopped when the same solenoid is deenergized thereby to close the valve. The valve V_1 is connected to an air tank 7 for holding herein air under pressure and supplying the air to the valve, while the valves V_2-V_5 are connected to a common air tank 8 for holding air under pressure and supplying the air to the valves. The air tanks 7, 9 are connected to a main tank 11 for holding therein source air under pressure, via electrically-operated air pressure control valves 9, 10, respectively, for controlling the air pressures in the respective air tanks 7, 8, hence the air injection pressures of the main weft inserting nozzle 1 and the auxiliary weft inserting nozzles 2-5.

Each of the solenoid-operated valves V_1-V_5 is actuated to open or close according to commands from the control C_1 which provides such commands in response to signals transmitted from a rotary encoder 12 monitoring the current angle of rotation of the weaving loom. Data for such commands to control the valves V_2-V_5 are stored in a data memory of the con-

trol C_1. Thus, the computer control C_1 functions to control the operation of the weft inserting nozzles 1-5 according to the above command data and also to a weft insertion control program stored in its program memory.

Pressure detectors 13, 14 are connected at their input to the air tanks 7, 8, respectively, for detecting the air pressures in the tanks, and at the output to a computer control C_2 for transmitting thereto information of the detected air pressures, so that the control C_2 provides a feedback control for the pressure control valves 9, 10 according to the current air pressures detected by the pressure detectors 13, 14. The computer control C_2 is connected also to the weft sensor 6 to receive therefrom information of time at which the leading end of each inserted weft reaches, or arrives at, the weft sensor 6 for controlling the operation of the pressure control valves 9, 10 so as to adjust the air pressures in the air tanks 7, 8, in accordance with an average arrival time which is determined by the control C_2 from a predetermined sampling number of the weft leading end arrival times detected by the weft sensor 6. The computer control C_2 has connected thereto an input device 15, a display device 16 and an operational mode selector switch 17. Data necessary for air injection pressure controlling may be inputted to the control C_2 through the input device 15.

Referring now to FIG. 2, there is shown a screen G_1 on the display device 16 in "adjusting" mode, indicating thereon the respective control factors for air injection pressure controlling in the trial weaving operation together with their data. On the screen G_1, α_1 designates the data of the maximum step, or the incremental step for air injection pressure adjustment. It is noted that this maximum step α_1 is used only when the control range, or the difference between the reference arrival time and the detected arrival time, becomes greater than $\beta_1 \cdot \gamma_1$ represents the data of the sampling number of the arrival times detected by the weft sensor 6 from which an average arrival time is to be figured out. Pm1 and Ps1 indicate the values of initial air pressures in the air tanks 7 and 8, respectively. $(Pm_1-\Delta Pm_1)$ and $(Pm_1+\Delta Pm_1)$ depict the values of allowable minimum and maximum limits of air pressure in the air tank 7, respectively. Similarly, $(Ps_1-\Delta Ps_1)$ and $(Ps_1+\Delta Ps_1)$ show the values of allowable minimum and maximum limits of air pressure in the air tank 8, respectively. These control factor data, or α_1, β_1, γ_1, Pm_1, ΔPm_1, Ps_1 and ΔPs_1, shown on the G_1 screen are employed in the adjusting mode for the trial weaving operation.

FIG. 3 shows a screen G_2 in "detecting" or trial mode, indicating thereon the data of the current arrival time detected by the weft sensor 6, expressed in the rotational angle Θ of the loom, and the data of the current air pressures Pm_2, Ps_2 in the air tanks 7, 8, hence the current air injection pressures of the main nozzle and the auxiliary nozzles, or sub nozzles, detected by the pressure detectors 13, 14.

FIG. 4 shows a screen G_3 in "production" mode, displaying the data of the respective control factors in the mode of production weaving operation. The control factor data including α_2, β_2, γ_2, Pm_2, ΔPm_2, Ps_2 and ΔPs_2 shown on the screen G_3 are used in the production mode for the actual production weaving operation.

FIGS. 5 and 6 shows a flow chart describing a program for changing the operational mode from the adjusting mode shown on the screens G_1 to the detecting mode on the screen G_2 and further to the production mode on the screen G_3. The computer control C_3 is operable in accordance with this program to control the air injection pressures of the weft inserting nozzles 1-5 during the trial and production weaving operations.

When the mode selector switch 17 is placed in its adjusting mode position, the computer control C_2 selects the control factor data for the adjusting mode and displays them on the screen G_1. Upon receiving a loom start signal, the loom is started to operate for trial weaving, with simultaneous changing of the display from the adjusting mode screen G_1 to the detecting mode screen G_2. While the loom is thus running for the trial weaving operation, the screen G_2 successively displays the values of the current air injection pressures of the main weft inserting nozzle 1 and the auxiliary nozzles V_2-V_5, or the pressures Pm_2, Ps_2 in the air tanks 7, 8 detected by the pressure detectors 13, 14, as well as the value of the current arrival time Θ. During this trial weaving operation in this detecting mode, the control G_2 functions to control the air injectionpressures in such a way that the detected arrival time Θ converge toward the reference arrival time. During the initial period in the trial weaving operation, in particular, controlling of the arrival time Θ and air injection pressures Pm_2, Ps_2 is performed in such a way that the weaving operation itself may be stabilized. When the variation of the detected arrival time Θ and pressures Pm_2, Ps_2 has become very little, the mode selector switch 17 is changed from the adjusting mode position to the production mode position. Accordingly, the screen G_2 is changed to the screen G_3, and the control C_2 selects the control factor data α_2, β_2, γ_2, Pm_2, $(Pm_2-\Delta Pm_2)$, $(Pm_2+\Delta Pm_2)$, Ps_2, $(Ps_2-\Delta Ps_2)$, $(Ps_2+\Delta Ps_2)$ and displays them on the screen G_3. That is, changing of the mode selector switch 17 from the adjusting mode to production mode position, the control factor data for the adjusting mode (or data for the trial weaving) are changed automatically to the control factor data for the production mode (or data for production weaving). It is to be noted that, when the mode is thus changed, the values of the air injection pressures Pm_2, Ps_2 just detected by the pressure detectors 13, 14 when the above mode changing is made are established as the reference air pressures of the main nozzle 1 and the auxiliary nozzles 2-5, re-

spectively, for the actual production weaving operation. As it is apparent from the foregoing, changing of the data of control factors for trial weaving operation to those for production weaving operation can be accomplished with extreme ease merely by changing the mode selector switch 17, thus contributing greatly to the reduction of downtime due to the conventional time-consuming setting-up procedure and hence to improvement in operating efficiency of a high-speed jet loom.

The value α_1 of the incremental step in the adjusting mode is set greater that the value az in the production mode so that optimum reference pressures Pm_2, Pm_2 may be reached as quickly as possible during the trial weaving operation in the adjusting mode. The value β_1 of the control range, or the difference between the reference arrival time and the detected arrival time, in the adjusting mode is set smaller that the value β_2 in the production mode so that as precise reference pressures Pm_2, Pm_2 as possible may be found out. Furthermore, the value $_1$ of the sampling number of arrival times in the adjusting mode is set smaller than the value $_2$ In the production mode for the purpose of finding the optimum injection pressures Pm_2, Pm_2 as quickly as possible.

Though, in the above illustrated embodiment, the values γ_1, γ_2 of the sampling number, as well as the values β_1, β_2 of the control range, are set different from each other between the adjusting and production modes, the values of either one pair, g_1, γ_2 or β_1, β_2, may be set different.

FIGS. 7 and 8 show a flow chart describing another program for changing the operational mode according to the second embodiment of the invention. In addition to the program of FIGS. 5, 6, this program includes an algorithm for automatically changing the operational mode from the production mode back to the adjusting mode when the reference air injection pressure is changed during the production weaving operation. Furthermore, the program has an additional function of automatically changing the operational mode from the adjusting mode to the production mode when the arrival times of a predetermined number of sampling fall consecutively within a predetermined permissible range and also the detected pressures are found stabilized during the trial weaving operation in the adjusting mode. Such automatic mode changing can make possible changing at the right time from the trial weaving to the production weaving operation.

As it is now apparent from the foregoing, in the first invention, wherein the injection pressure setting means is provided with a function of selecting the data of control factors in accordance with the selection operation of the selector switch, it can make possible injection pressure controlling for the trial weaving operation and the production weaving operation merely by a simple operation of the selector switch and also smooth changeover from the trial weaving to the production weaving operation without any troublesome and time-consuming setting-up procedure.

The second embodiment of the invention can offer an advantageous effect in that the weaving operation can be shifted automatically from the trial weaving to the actual production when the arrival times of a predetermined sampling number fall within a permissible range and the variation in the detected pressures are found very little, thus realizing the changeover from the trial weaving to the production weaving operation even without any changing operation.

Designation of reference numbers

1 Weft inserting main nozzle; 2 Weft inserting auxiliary nozzles; 6 Weft detector as the means for determining the time at which the leading end of each insert weft arrives at the weft detector; 9, 10 Electrically-operated air pressure control valves as the injection pressure adjusting means; 13, 14 Pressure detectors; C_2 Computer control as the injection pressure setting means; 17 Operational mode selector switch as the selecting means.

Claims

1. Apparatus for controlling weft inserting air pressure in a jet loom wherein weft insertion is accomplished by air injection from weft inserting nozzle (1) and the air injection pressures of said nozzle (1) is controlled in accordance with the information representative of time at which the leading end of an inserted weft arrives at a predetermined position in the loom, said apparatus comprising:

weft detecting means (6) disposed at said predetermined position in the loom for detecting the leading end of each inserted weft to determine the time at which the leading end has just arrived at said weft detecting means (6);

pressure detecting means (13) for detecting air injection pressure of said weft inserting nozzle (1);

injection pressure setting means (9, C_2) for storing data of injection pressure control factors for trial weaving operation and data of injection pressure control factors for production weaving operation and also storing data of detected injection pressure, said control factors including the sampling number of said arrival times at which the leading end of respective inserted wefts have arrived at said weft detecting means, the incremental step for injection pressure adjustment and the range of permissible maximum and minimum limits of the injection pressure;

injection pressure adjusting means (9, 10)

responding to commands from said injection pressure (C2, 9) setting means for adjusting the injection pressure of said weft inserting nozzle (1); and

selecting means for selecting the data of control factors for the trial weaving operation or the data of control factors for production weaving operation;

said injection pressure setting means (9, 10) having a function of selecting (17)the data of control factors for the trial weaving operation or the data of control factor for production weaving operation in accordance with the selecting operation of said selecting means (13, 14), and also a function of setting the injection pressure detected by said pressure detecting means just when said selecting operation is made for the selection of the data for the production weaving operation as reference injection pressure for that production weaving operation.

2. Apparatus for controlling weft inserting air pressure in a jet loom wherein weft insertion is accomplished by air injection from weft inserting nozzle (1) and the air injection pressures of said nozzle (1) is controlled in accordance with the information representative of time at which the leading end of an inserted weft arrives at a predetermined position in the loom, said apparatus comprising:

weft detecting means (6) disposed at said predetermined position in the loom for detecting the leading end of each inserted weft to determine the time at which the leading end has just arrived at said weft detecting means (6);

pressure detecting means (13) for detecting air injection pressure of said weft inserting nozzle (1);

injection pressure setting means (9, C_2) for storing data of injection pressure control factors for trial weaving operation and data of injection pressure control factors for production weaving operation and also storing data of detected injection pressure, said control factors including the sampling number of said arrival times at which the leading end of respective inserted wefts have arrived at said weft detecting means (6), the incremental step for injection pressure adjustment and the range of permissible maximum and minimum limits of the injection pressure; and

injection pressure adjusting means (9, 10) responding to commands from said injection pressure setting means (C_2, 9) for adjusting the injection pressure of said weft inserting nozzle (1);

said injection pressure setting means (C_2, 9, 10, 17)) having a function of selecting the data of control factors for the production weaving operation when the arrival times of a predetermined sampling number fall within a predetermined permissible range and the variation of detected injection pressures falls within a predetermined range, and also a function of setting the injection pressure detected by said pressure detecting means just when the data of control factors for the production weaving operation are selected by said injection pressure setting means (17, C_2) as reference injection pressure for that production weaving operation.

3. Apparatus for controlling weft inserting air pressure in a jet loom wherein weft insertion is accomplished by air injection from weft inserting nozzle (1) and the air injection pressures of said nozzle (1) is controlled in accordance with the information representative of time at which the leading end of an inserted weft arrives at a predetermined position in the loom, said apparatus comprising:

weft detecting means (6) disposed at said predetermined position in the loom for detecting the leading end of each inserted weft to determine the time at which the leading end has just arrived at said weft detecting means (6);

pressure detecting means (13) for detecting air injection pressure of said weft inserting nozzle (1);

injection pressure setting means (9, C_2) for storing data of injection pressure control factors for trial weaving operation and data of injection pressure control factors for production weaving operation and also storing data of detected injection pressure, said control factors including the sampling number of said arrival times at which the leading end of respective inserted wefts have arrived at said weft detecting means, the incremental step for injection pressure adjustment and the range of permissible maximum and minimum limits of the injection pressure;

injection pressure adjusting means (9, 10) responding to commands from said injection pressure setting means (C_2) for adjusting the injection pressure of said weft inserting nozzle (1).

4. Apparatus as claimed in claim 3 futher comprising selecting means for selecting the data of control factors for the trial weaving operation or the data of control factors for production weaving operation.

5. Apparatus as claimed in claim 3 or claim 4, said injection pressure setting means (9, 10) having a function of selecting (17) the data of control factors for the trial weaving operation or the data of control factor for production weaving operation in accordance with the selecting operation of said selecting means.

6. Apparatus as claimed in any of claims 3 to 5 said injection pressure setting means further having a function of setting the injection pressure detected by said pressure detecting means (13, 14) just when said selecting operation is made for the selection of the data for the production weaving operation as reference injection pressure for that production weaving operation.

7. Apparatus as claimed in any of claims 3 to 6, said injection pressure setting means (C_2, 9, 10, 17) having a function of selecting the data of control factors for the production weaving operation when the arrival times of a predetermined sampling number fall within a predetermined permissible range

8. Apparatus as claimed in any of claims 3 to 7 said injection pressure setting means (C_2, 9, 10) having a function of selecting the data of control factors for the production weaving operation when the variation of detected injection pressures falls within a predetermined range.

9. Apparatus as claimed in any of claims 3 to 8, said injection pressure (C_2, 9, 10) setting means having a function of setting the injection pressure detected by said pressure detecting means (C_2, 9, 10) just when the data of control factors for the production weaving operation are selected by said injection pressure setting means (C_2, 9, 10) as reference injection pressure for that production weaving operation.

10. Air jet loom with an apparatus as claimed in any of claims 1 to 9

Fig. 1

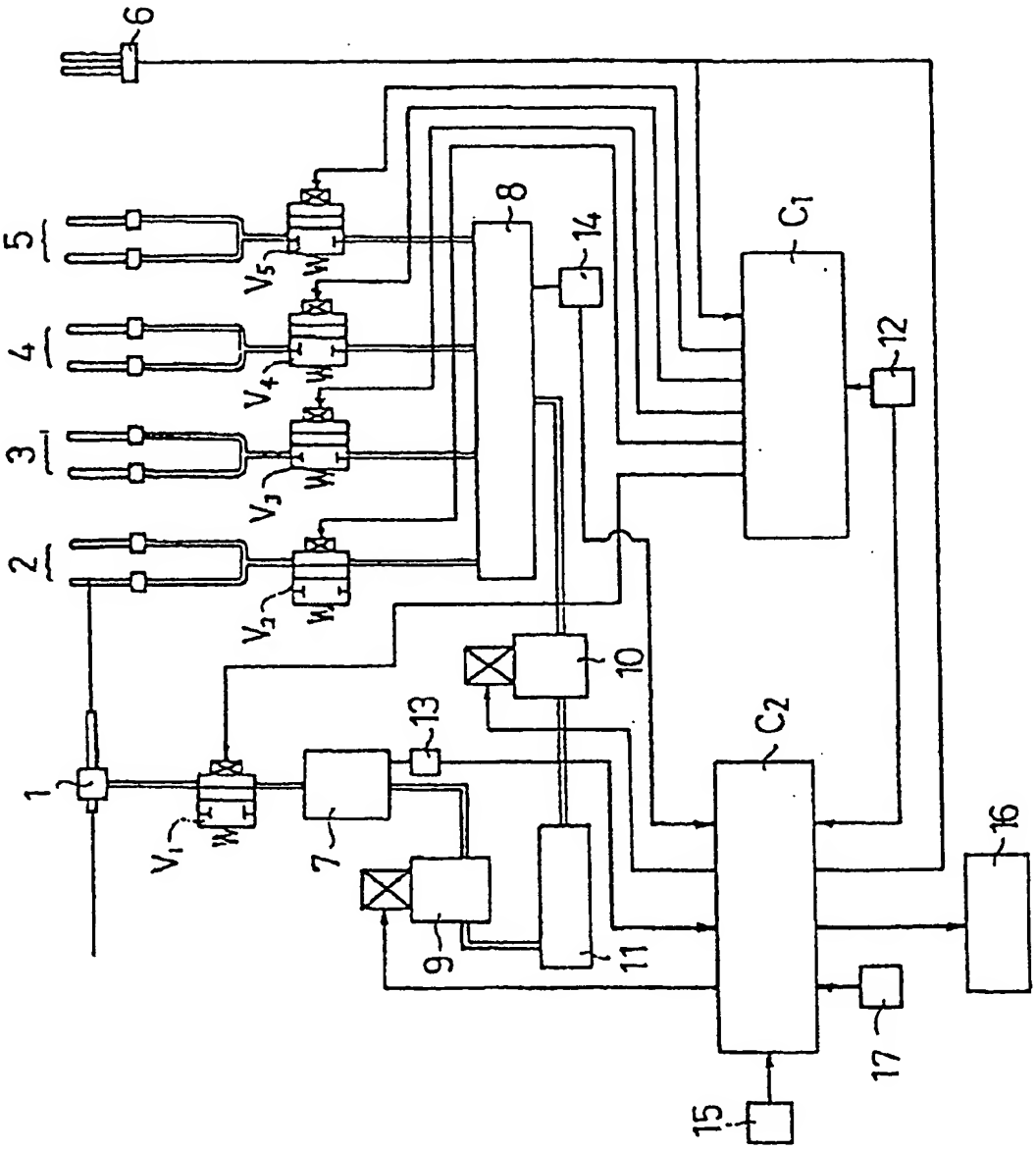


Fig. 2

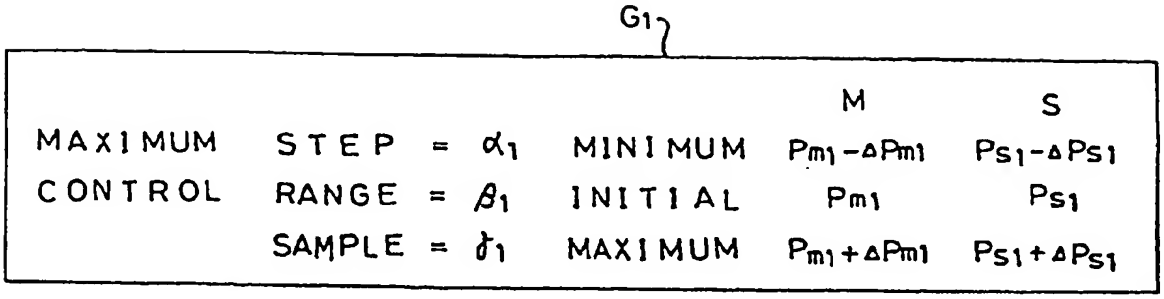


Fig. 3

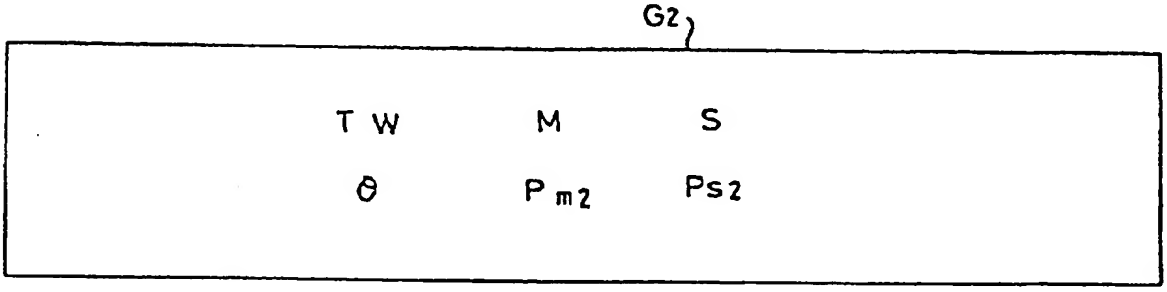


Fig. 4

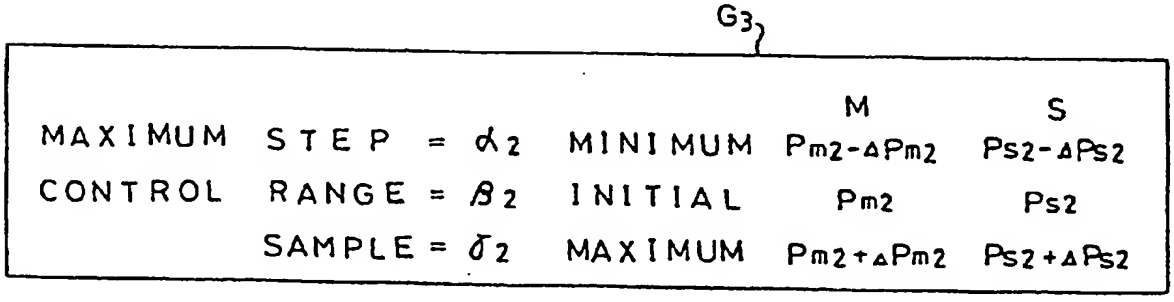


Fig. 5

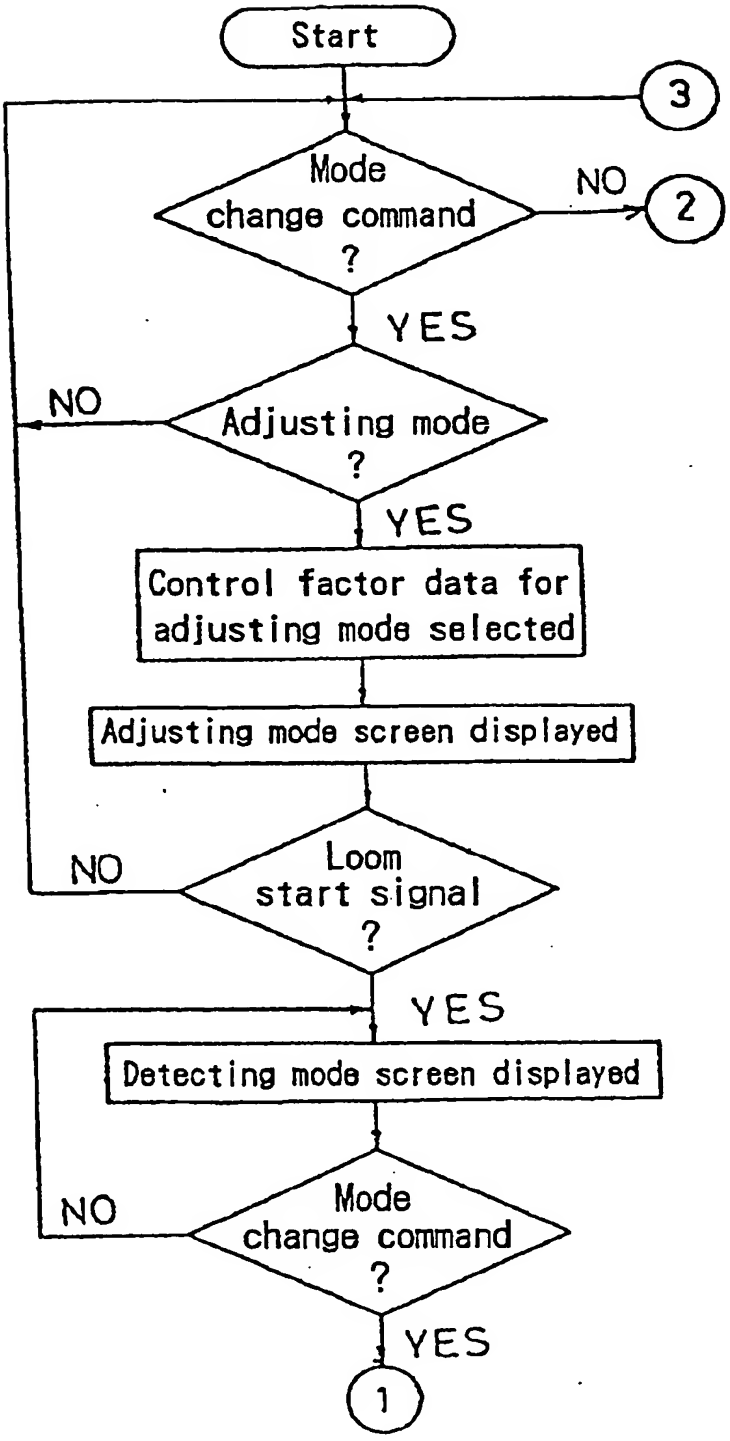

Start
3
Mode change command ?
NO
2
YES
Adjusting mode ?
NO
YES
Control factor data for adjusting mode selected
Adjusting mode screen displayed
Loom start signal ?
NO
YES
Detecting mode screen displayed
Mode change command ?
NO
YES
1

Fig. 6

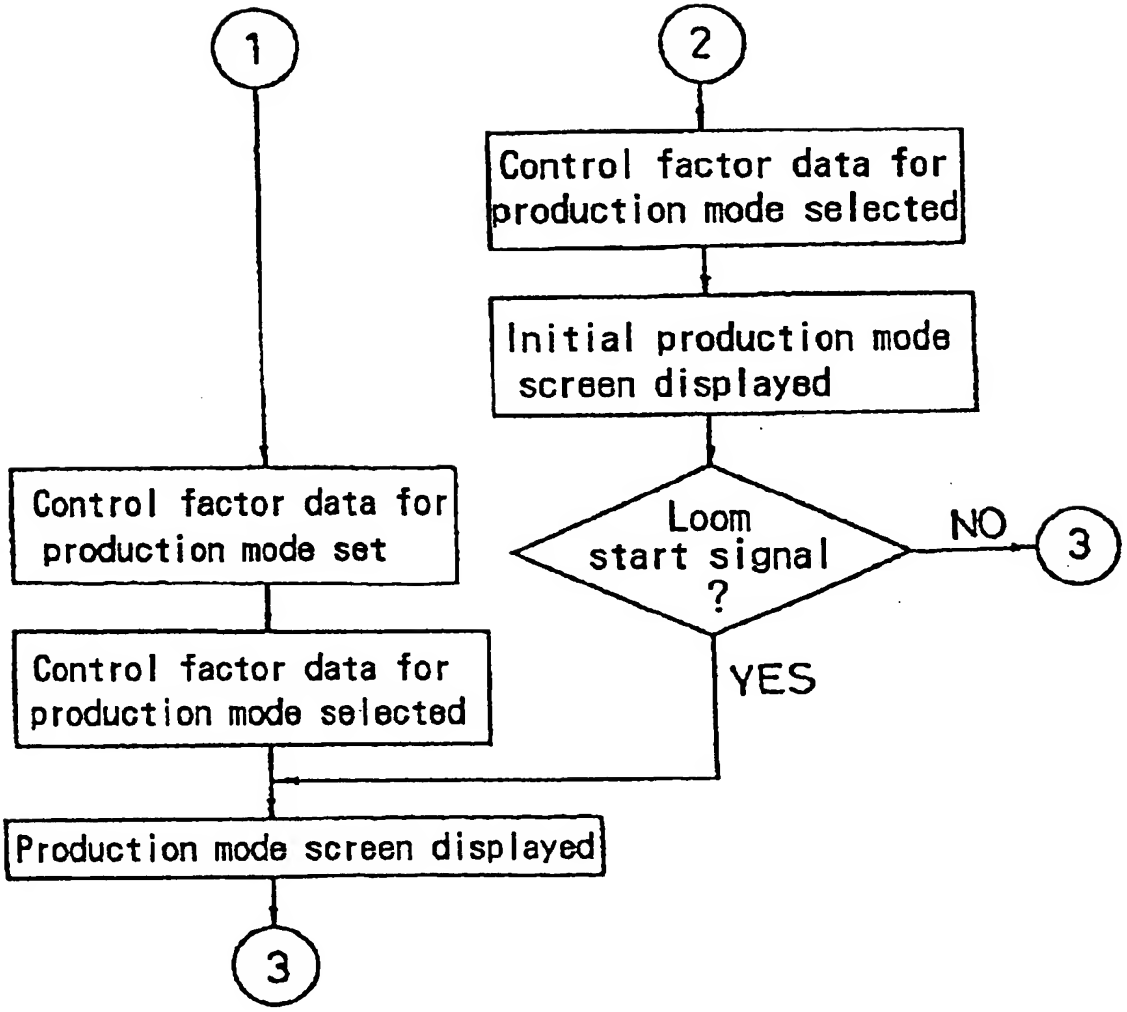

1
2
Control factor data for production mode selected
Initial production mode screen displayed
Control factor data for production mode set
Loom start signal ?
NO
3
YES
Control factor data for production mode selected
Production mode screen displayed
3

Fig. 7

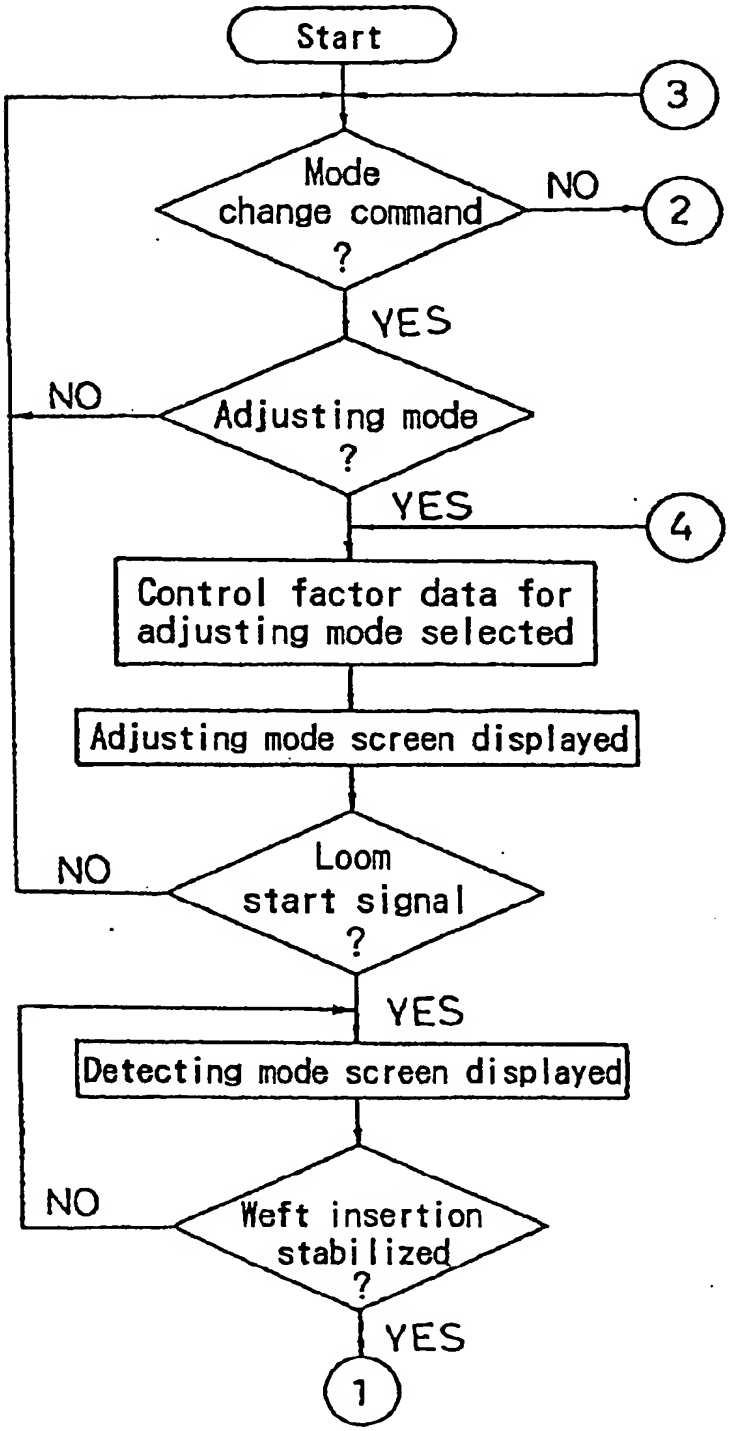
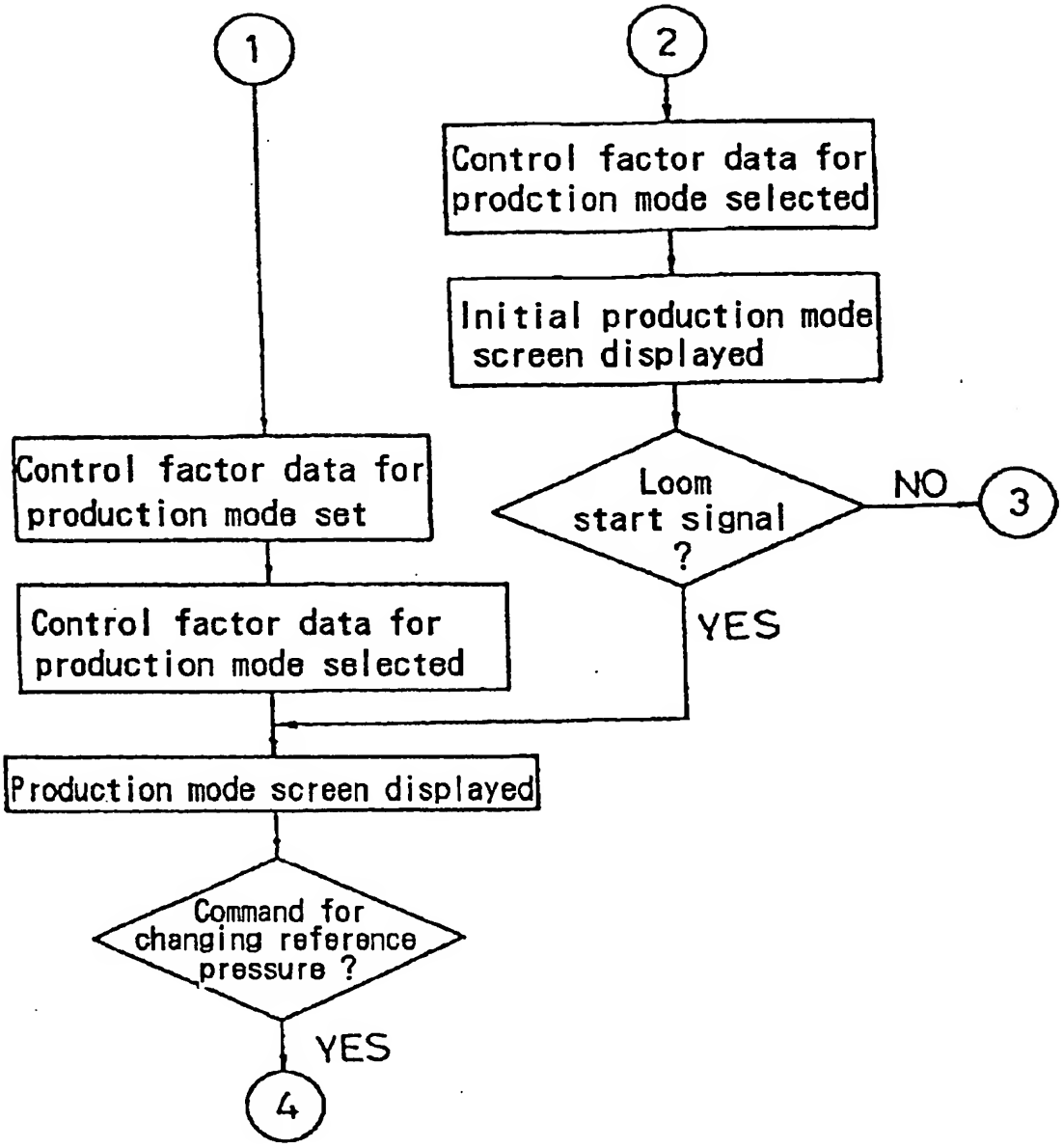

Start
3
Mode change command ?
NO
2
YES
Adjusting mode ?
NO
YES
4
Control factor data for adjusting mode selected
Adjusting mode screen displayed
Loom start signal ?
NO
YES
Detecting mode screen displayed
Weft insertion stabilized ?
NO
YES
1

Fig. 8


1
2
Control factor data for prodction mode selected
Initial production mode screen displayed
Control factor data for production mode set
Loom start signal ?
NO
3
YES
Control factor data for production mode selected
Production mode screen displayed
Command for changing reference pressure ?
YES
4

European Patent Office

EUROPEAN SEARCH REPORT

Application Number

EP 91 81 1000

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.5)
X	EP-A-0 276 829 (TSUDACOMA CORP) * page 3, column 3, line 46 - page 4, column 6, line 34; figures 1-3 *	1-10	D03D47/30
A	EP-A-0 263 445 (TSUDACOMA CORP.) * page 5, column 7, line 26 - page 7, column 11, line 10; figures 1-8 *	1-10	
			TECHNICAL FIELDS SEARCHED (Int. Cl.5)
			D03D

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	06 APRIL 1992	HENNINGSEN O.

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